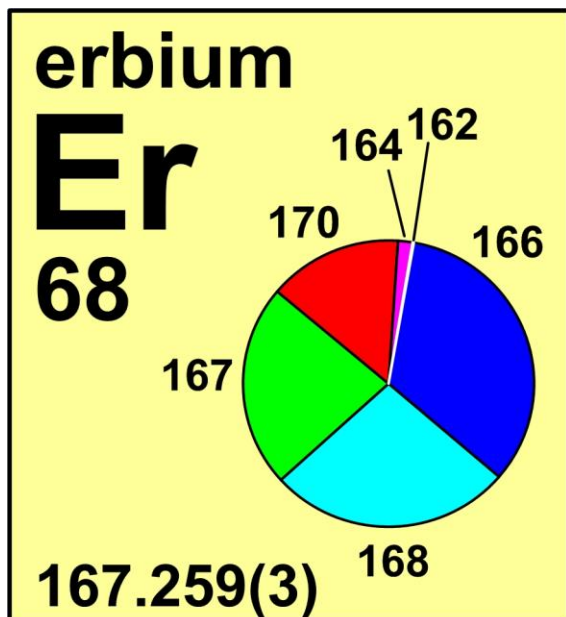





erbium

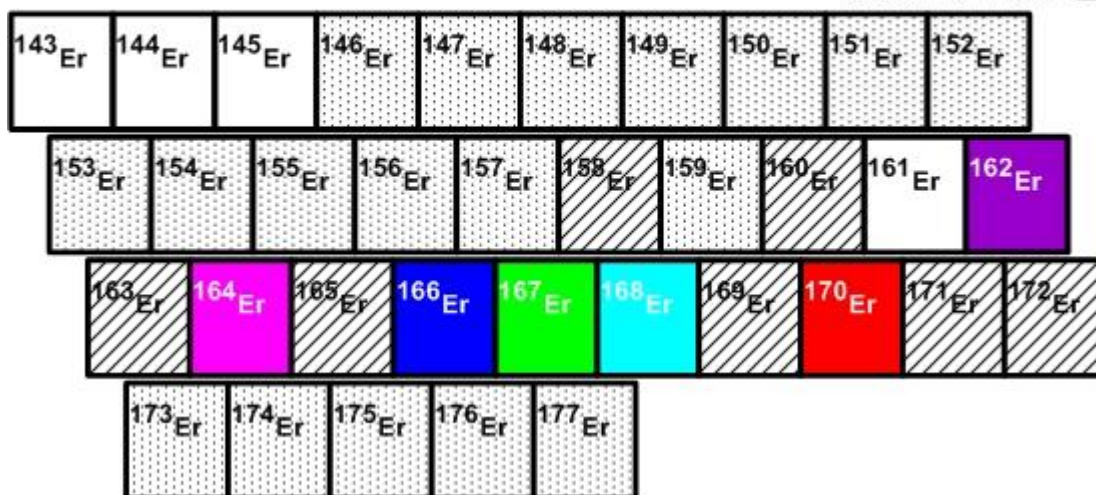


Stable isotope	Atomic mass*	Mole fraction
^{162}Er	161.928 778	0.001 39
^{164}Er	163.9292	0.016 01
^{166}Er	165.930 2931	0.335 03
^{167}Er	166.932 0482	0.228 69
^{168}Er	167.932 3702	0.269 78
^{170}Er	169.935 4643	0.149 10

* Atomic mass given in unified atomic mass units, u.

Half-life of radioactive isotope

Less than 1 second 
Between 1 second and 1 hour 
Greater than 1 hour 



Important applications of stable and/or radioactive isotopes

Isotopes in medicine

- ^{169}Er is used in radiation synovectomy, which is a regularly practiced nuclear medicine therapy, on rheumatoid arthritis patients whose condition is resistant to standard methods of treatment. Rheumatoid arthritis is a chronic, inflammatory autoimmune disease of the joint capsule (synovial sac), which is lined with a thin membrane called the synovium, of an individual's moveable joints (synovial joints). In radiation synovectomy, a rheumatoid arthritis patient undergoes a very short range intraarticular injection of small particles that are labeled with β -emitting isotopes, such as ^{169}Er , which are phagocytized (engulfed) by macrophage-like synoviocytes as well as other phagocytizing inflammatory cells in the

patient's subsynovial connective tissue. Necrosis (tissue death) and the inhibition of cell proliferation (increase in number of cells) results from the radiation of the synovium, and therefore temporarily halts synovitis (which is the condition of when the synovium thickens with inflammation) and improves synovial joint function.

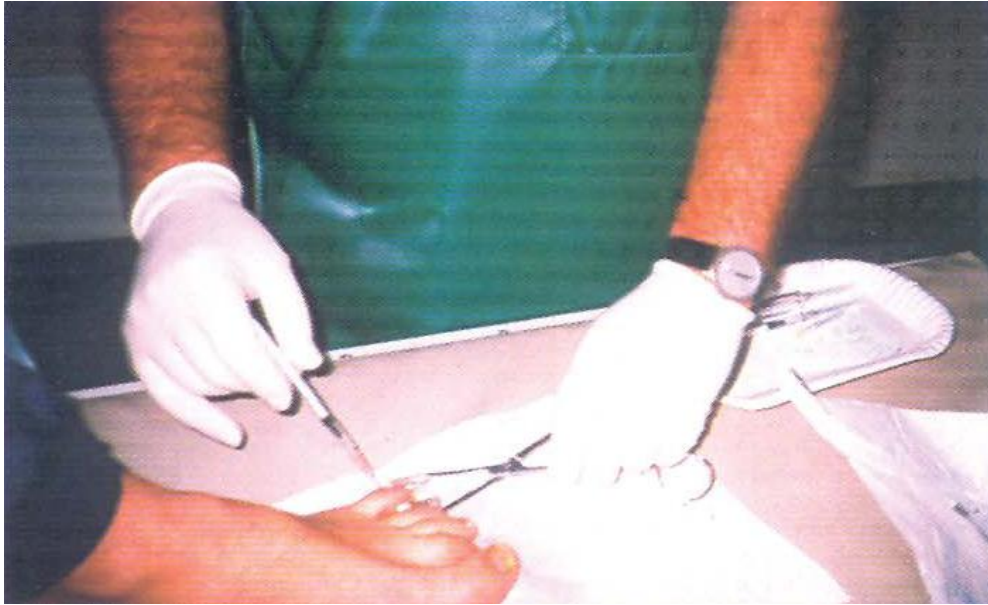


Figure 1: Rheumatoid arthritis patient undergoing radiation synovectomy with ^{169}Er .



Figure 2: Rheumatoid arthritis patient undergoing radiation synovectomy with radiopharmaceutical ^{169}Er - citrate colloid.

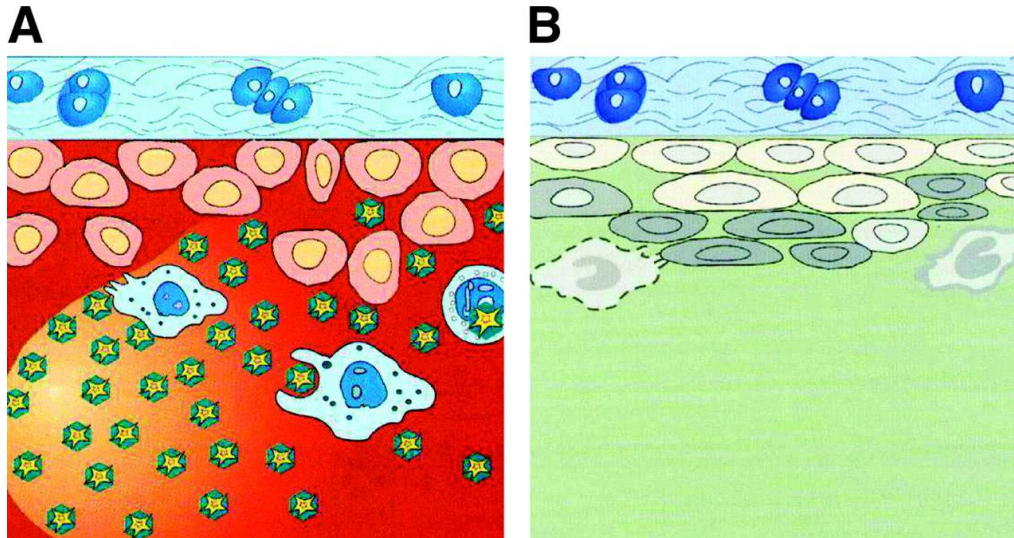


Figure 3: Mechanism of Action of Radiation Synovectomy. (A) This diagram illustrates a patient's inflamed synovium (red), which has been injected with β -emitting particles (^{169}Er , represented by yellow stars) that are being phagocytized by synoviocytes and other phagocytizing inflammatory cells. The top blue layer is tissue (cartilage), which remains unaffected from the radiation synovectomy. (B) The radiation from radiation synovectomy can cause necrosis (tissue death), sloughing of cells, synovium regression, and/or sclerosis (thickening of tissue). This diagram illustrates what can result from diagram A, the radiation of the synovium, which is cell damage as well as sclerosis of the synovial membrane. The cartilage layer of tissue still remains unaffected.

Isotopes in tracer studies

- 1) Radiolabeled ^{171}Er tablets have been used to detect and monitor transit through the GI tract of individuals using external scintigraphy. These tablets are made by using enteric coated tablets that contain small amounts of stable erbium oxide (^{170}Er) and irradiating them in a small neutron flux in order to produce radioactive labeled ^{171}Er tablets.